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## Acrylic Solution Pressure Sensitive Adhesive

# DURO-TAK® 387-2054 / 87-2054

### DESCRIPTION

DURO-TAK 387-2054 / 87-2054 is an acrylate-vinylacetate self-curing pressure sensitive adhesive supplied in an organic solvent solution.

### TYPICAL APPLICATIONS

Transdermal drug delivery systems

### TYPICAL PHYSICAL PROPERTIES\*

| Test Method                                       |                                                                                                |
|---------------------------------------------------|------------------------------------------------------------------------------------------------|
| Solids content                                    | 47.5 %                                                                                         |
| Viscosity – Brookfield<br>(25°C, #21, 10rpm, 66A) | 2750 cPs<br>2750 mPa·s                                                                         |
| Relative Viscosity<br>(20°C)                      | 2.7                                                                                            |
| Solvent Composition<br>(% of total solvent)       | Ethyl acetate 36 %<br>Isopropanol 36 %<br>Heptane 24 %<br>Toluene 4 %<br>2,4-Pentanedione <1 % |
| Tg (theoretical)                                  | -50°C                                                                                          |
| Appearance<br>Solution                            | Clear, slightly yellow liquid                                                                  |
| Dried thin film                                   | Clear, colorless                                                                               |

### SAFETY TESTING

As an indication of the suitability of these products for skin contact use, National provides results from the following safety testing:

- Cytotoxicity (USP MEM Elution Method) – Non-cytotoxic
- Primary Dermal Irritation – 0.29
- Buehler Sensitization – Non-sensitizing
- USP Class VI – Meets USP requirements.

### REGULATORY STATUS

- FDA Drug Master File: DMF# 4571 – FDA will review this information for you upon receipt of an authorization letter from National Starch & Chemical. Outside the USA, the DMF information is compiled into a confidential "Applicant's Information Package" (AIP).
- FDA Food Contact Status  
Dry film components comply with the following FDA Indirect Food Additive Regulations:  
- 21 CFR 175.105 "Adhesives"  
- 21 CFR 176.180\*\* "Components of paper and paperboard in contact with dry food"  
- 21 CFR 176.170\*\* (paragraph b)  
"Components of paper and paperboard in contact with aqueous or fatty food."  
\*\* subject to extractive limitations of the regulation.

### STORAGE & SUGGESTED USABLE LIFE

Store drums in a dry area and keep them tightly covered to prevent solvent loss or contamination. The suggested usable life of DURO-TAK 387-2054 / 87-2054 is 12 months from the date of manufacture in unopened containers. For more details, please review the DURO-TAK Product Life document.

### PRECAUTIONS

Review the MSDS carefully. Mix well before use. If dilution is required, ethyl acetate (low moisture content) is suggested.

### TYPICAL PERFORMANCE PROPERTIES\*

| Test Method                                   | Common                           | Metric                              |
|-----------------------------------------------|----------------------------------|-------------------------------------|
| 180° Peel<br>20 minutes<br>24 hours<br>1 week | 40 oz/in<br>50 oz/in<br>60 oz/in | 11 N/25mm<br>13 N/25mm<br>17 N/25mm |
| Shear<br>(22°C)                               | (4 psi)<br>40 hours              | (1 kg, 2.5-1.25cm)<br>40 hours      |
| Tack (Loop)                                   | 45 oz/in <sup>2</sup>            | 16 N/25mm <sup>2</sup>              |

\* Typical Properties are provided as guidelines only - this data should not be used for setting specifications.

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The information given and the recommendations made herein are based on our research and are believed to be accurate but no guarantee of their accuracy is made. In every case we urge and recommend that purchasers before using any product in full scale production make their own tests to determine to their own satisfaction whether the product is of acceptable quality and is suitable for their particular purposes under their own operating conditions. No representative of ours has any authority to waive or change the foregoing provisions but, subject to such provisions, our engineers are available to assist purchasers in adapting our products to their needs and to the circumstances prevailing in their business. Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute a permission, inducement or recommendation to practice any invention covered by any patent, without the authority from the owner of this patent. We also expect purchasers to use our products in accordance with the guiding principles of the Chemical Manufacturers Association's Responsible Care® program.

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## Acrylic Solution Pressure Sensitive Adhesive

# DURO-TAK® 387-2052 / 87-2052

### DESCRIPTION

DURO-TAK 387-2052 / 87-2052 is an acrylate-vinylacetate self-curing pressure sensitive adhesive supplied in an organic solvent solution.

### TYPICAL APPLICATIONS

Transdermal drug delivery systems

### TYPICAL PHYSICAL PROPERTIES\*

| Test Method                                       |                                                                        |
|---------------------------------------------------|------------------------------------------------------------------------|
| Solids content                                    | 47.5 %                                                                 |
| Viscosity – Brookfield<br>(25°C, #21, 10rpm, SSA) | 2750 cPs<br>2750 mPa.s                                                 |
| Relative Viscosity<br>(20°C)                      | 2.7                                                                    |
| Solvent Composition<br>(% of total solvent)       | Ethyl acetate 39 %<br>Isopropanol 27 %<br>Ethanol 22 %<br>Heptane 12 % |
| Tg (theoretical)                                  | -50°C                                                                  |
| Appearance<br>Solution                            | Clear, slightly yellow liquid                                          |
| Dried thin film                                   | Clear, colorless                                                       |

### SAFETY TESTING

As an indication of the suitability of these products for skin contact use, National provides results from the following safety testing:

- Cytotoxicity (USP MEM Elution Method) – Non-cytotoxic
- Primary Dermal Irritation – 0.46
- Buehler Sensitization – Non-sensitizing
- USP Class VI – Meets USP requirements.

### REGULATORY STATUS

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- FDA Food Contact Status  
Dry film components comply with the following FDA Indirect Food Additive Regulations:  
- 21 CFR 175.105 "Adhesives"  
- 21 CFR 176.180\*\* "Components of paper and paperboard in contact with dry food"  
- 21 CFR 176.170\*\* (paragraph-b)  
"Components of paper and paperboard in contact with aqueous or fatty food."  
\*\* subject to extractive limitations of the regulation.

### TYPICAL PERFORMANCE PROPERTIES\*

| Test Method                                   | Common                           | Metric                              |
|-----------------------------------------------|----------------------------------|-------------------------------------|
| 180° Peel<br>20 minutes<br>24 hours<br>1 week | 40 oz/in<br>50 oz/in<br>60 oz/in | 11 N/25mm<br>13 N/25mm<br>17 N/25mm |
| Shear<br>(22°C)                               | (4 psi)<br>40 hours              | (1 kg, 2.5-1.25cm)<br>40 hours      |
| Tack (Loop)                                   | 45 oz/in <sup>2</sup>            | 16 N/25mm <sup>2</sup>              |

\* Typical Properties are provided as guidelines only - this data should not be used for setting specifications.

### STORAGE & SUGGESTED USABLE LIFE

Store drums in a dry area and keep them tightly covered to prevent solvent loss or contamination. The suggested usable life of DURO-TAK 387-2052 / 87-2052 is 12 months from the date of manufacture in unopened containers. For more details, please review the DURO-TAK Product Life document.

### PRECAUTIONS

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## Acrylic Solution Pressure Sensitive Adhesive

# DURO-TAK® 387-2287 / 87-2287

### DESCRIPTION

DURO-TAK 387-2287 / 87-2287 is an acrylate-vinylacetate non-curing pressure sensitive adhesive supplied in an organic solvent solution.

### TYPICAL APPLICATIONS

Transdermal drug delivery systems

### TYPICAL PHYSICAL PROPERTIES\*

| Test Method                                         |                                |
|-----------------------------------------------------|--------------------------------|
| Solids content                                      | 50.5 %                         |
| X Viscosity – Brookfield<br>(25°C, #27, 10rpm, SSA) | 18000 cPs<br>18000 mPa·s       |
| Relative Viscosity<br>(20°C)                        | 3.6                            |
| Solvent Composition<br>(% of total solvent)         | Ethyl acetate 100 %            |
| X Tg (theoretical)                                  | -35°C                          |
| Appearance<br>Solution                              | Clear, slightly haze<br>liquid |
| Dried thin film                                     | Clear, colorless               |

### TYPICAL PERFORMANCE PROPERTIES\*

| Test Method     | Common                | Metric                          |
|-----------------|-----------------------|---------------------------------|
| 180° Peel       |                       |                                 |
| 20 minutes      | 50 oz/in              | 14 N/25mm                       |
| 24 hours        | 55 oz/in              | 15 N/25mm                       |
| 1 week          | 60 oz/in              | 17 N/25mm                       |
| Shear<br>(22°C) | (2 psi)<br>2 hours    | (0.5 kg, 2.5-1.25cm)<br>2 hours |
| Tack (Loop)     | 45 oz/in <sup>2</sup> | 12 N/25mm <sup>2</sup>          |

\* Typical Properties are provided as guidelines only - this data should not be used for setting specifications.

### ADHESIVE FEATURES

- Can be used as a tackifier for other acrylic solution PSA's
- Soft, non-curing adhesive

### SAFETY TESTING

As an indication of the suitability of these products for skin contact use, National provides results from the following safety testing:

- Cytotoxicity (USP MEM Elution Method) – Non-cytotoxic
- Primary Dermal Irritation – 1.7
- Buehler Sensitization – Non-sensitizing
- USP Class VI – Meets USP requirements.

### REGULATORY STATUS

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### STORAGE & SUGGESTED USABLE LIFE

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**Technical Information**TI/ES 1416 us  
April 2003

Supersedes edition dated April 1989

**Oppanol® B types**® = Registered trademark of  
BASF Aktiengesellschaft**Oppanol B 30 SF**  
**Oppanol B 50 / B 50 SF**  
**Oppanol B 80**

These Oppanol B types are used for producing adhesives, sealants, lubricating oils, coating compounds, and chewing gum. They are also recommended for modifying bitumen.

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## Other properties

| Oppanol B type                                                      | 30      | 50      | 80      |
|---------------------------------------------------------------------|---------|---------|---------|
| Relative molecular mass $M_v$ <sup>1)</sup><br>(viscosity averages) | 200 000 | 400 000 | 800 000 |
| Relative molecular mass $M_n$ <sup>2)</sup><br>(number averages)    | 73 000  | 120 000 | 200 000 |
| Glass temperature $T_g$ °C<br>(DSC)                                 | -64     | -63     | -63     |

<sup>1)</sup> The viscosity average of the relative molecular mass is calculated as follows:

$$M_v = \frac{0.65}{3.08} \sqrt{\frac{J_v \times 10^2}{3.08}}$$

<sup>2)</sup> The number average of the relative molecular mass is calculated as follows:

$$M_n = \frac{0.94}{2.27} \sqrt{\frac{J_n \times 10^3}{2.27}}$$

## Properties that are independent of the relative molecular mass

|                                                              | Unit                                                       | Value                  |
|--------------------------------------------------------------|------------------------------------------------------------|------------------------|
| Density at 20 °C                                             | g · cm <sup>-3</sup>                                       | 0.92                   |
| Thermal coefficient of cubic expansion at 23 °C              | K <sup>-1</sup>                                            | 6.3 · 10 <sup>-4</sup> |
| Specific heat c                                              | kJ · kg <sup>-1</sup> · K <sup>-1</sup>                    | 2.0                    |
| Thermal conductivity λ                                       | W · K <sup>-1</sup> · m <sup>-1</sup>                      | 0.19                   |
| Refractive index $n_D^{20}$                                  |                                                            | 1.51                   |
| Dielectric constant $\epsilon_r$ (50 Hz, 23 °C)<br>DIN 53483 |                                                            | 2.2                    |
| Dissipation factor tan δ<br>(50 Hz, 23 °C)                   |                                                            | ≤ 5 · 10 <sup>-4</sup> |
| Volume resistivity                                           | Ω · cm                                                     | 10 <sup>16</sup>       |
| Water-vapour permeation coefficient                          | g · m <sup>-1</sup> · h <sup>-1</sup> · mbar <sup>-1</sup> | 2.5 · 10 <sup>-7</sup> |

## Viscosity

The Oppanol B types exhibit cold flow dependent on the relative molecular mass. As a result of chain entanglements, the molecular network in high molecular-weight Oppanol B is similar to that of crosslinked rubber. The network of polyisobutene is not held together by chemical bonds, and it yields under sustained loads as the chain becomes disentangled. Under sustained loads, high-molecular-weight Oppanol B behaves like a liquid, or in other words, it undergoes plastic deformation.

High-molecular-weight polyisobutene has the same viscoelastic behaviour as a molten polymer.

## Solubility

Oppanol B is soluble in aliphatic, aromatic, cyclic, and halogenated hydrocarbons. It is swollen by alcohols, ethers, esters, and ketones, the extent of swelling increasing with the length of the hydrocarbon chain.

The rate at which Oppanol B is dissolved or swollen by homologous solvents is inversely proportional to the molecular mass of the solvent (rate of swelling in pentane > in mineral spirit b.p. 65–95 °C > in mineral spirit b.p. 150–200 °C > in diesel oil.)

The viscosity of middle and high-molecular-weight polyisobutene solutions in various solvents varies widely owing to the differences in the degree of solvation.